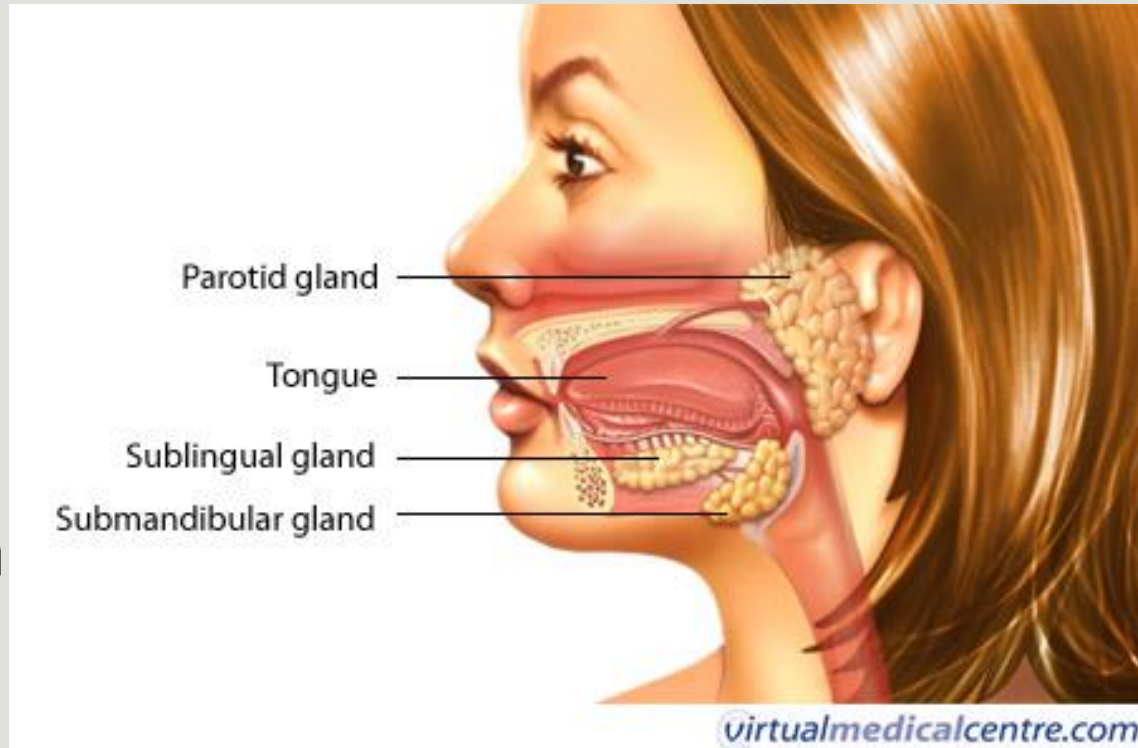


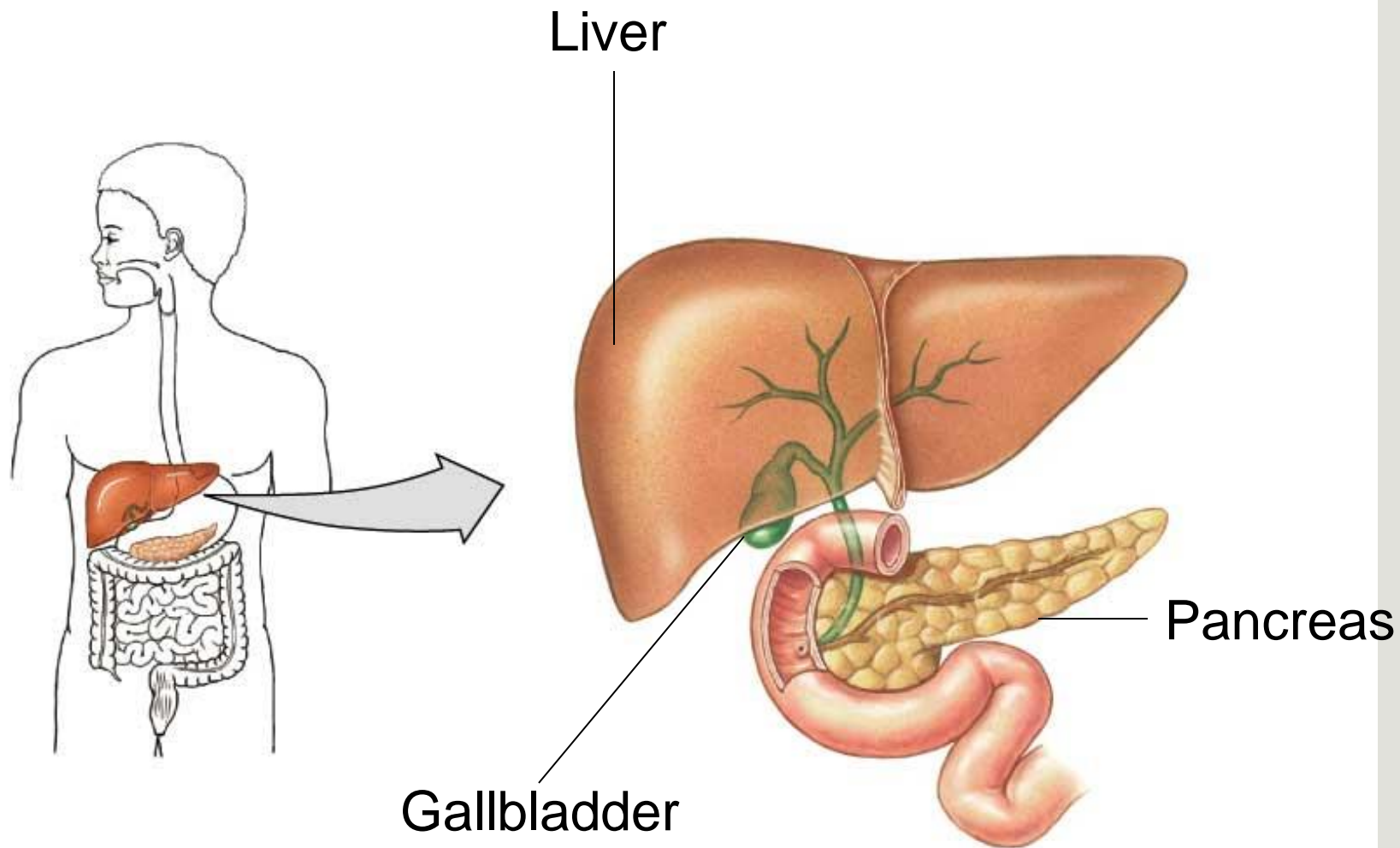
5.10 The Digestive System

ACCESSORY ORGANS AND THEIR ASSOCIATED
ENZYMES

Salivary Glands

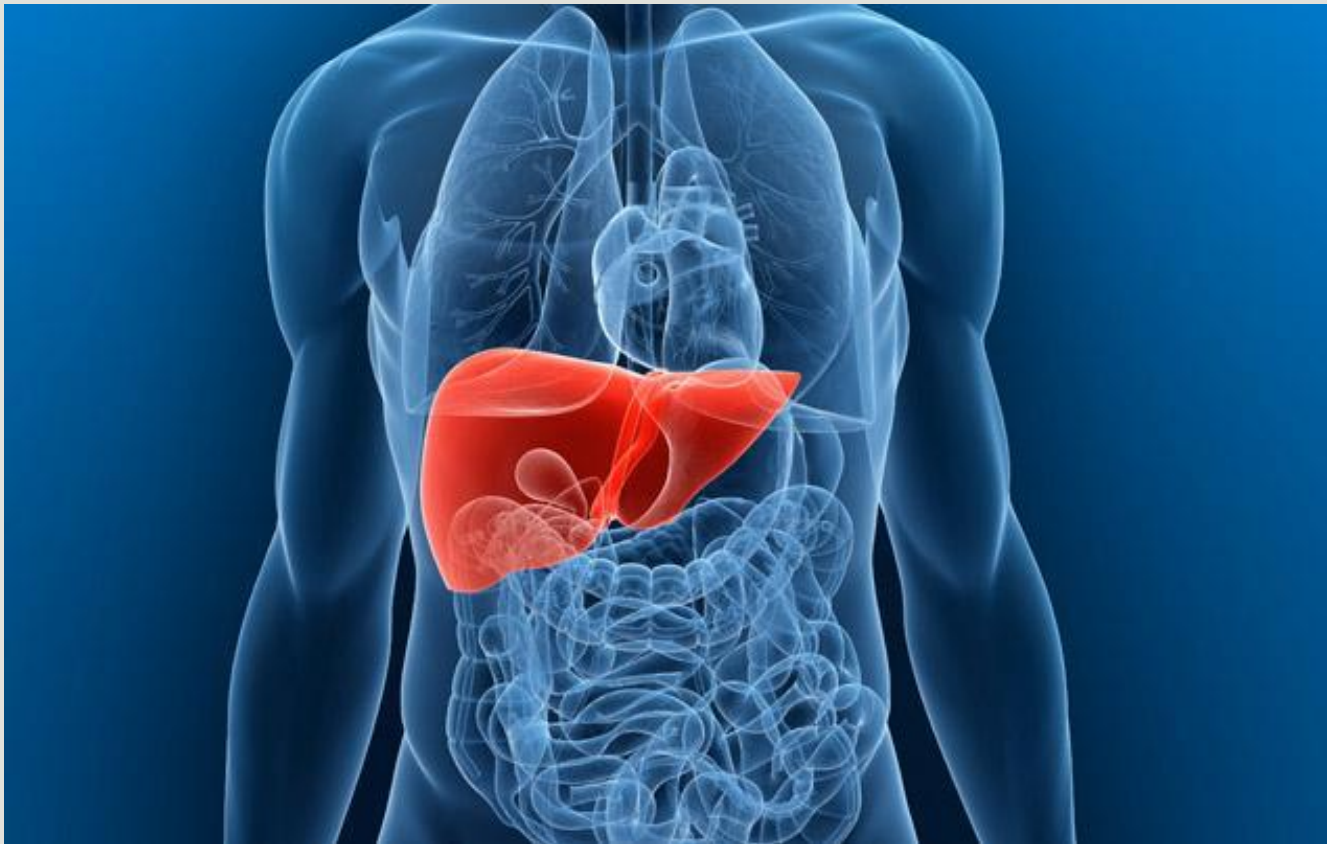
- **Parotid** (puh-rot-id) **glands** secrete watery fluid that contains **salivary amylase**
 - Begins to break down starch
- Other two glands in mouth produce slippery mucus to help swallow food bolus





Liver

Second largest organ in body





Liver

Produces **bile**

- Contains bile salts, bile acids, water, cholesterol, phospholipids, and fatty acids.
- Bile breaks down fats

Liver filters the blood

- Extracts toxins and prepares nutrients for circulation

Stores glucose as glycogen

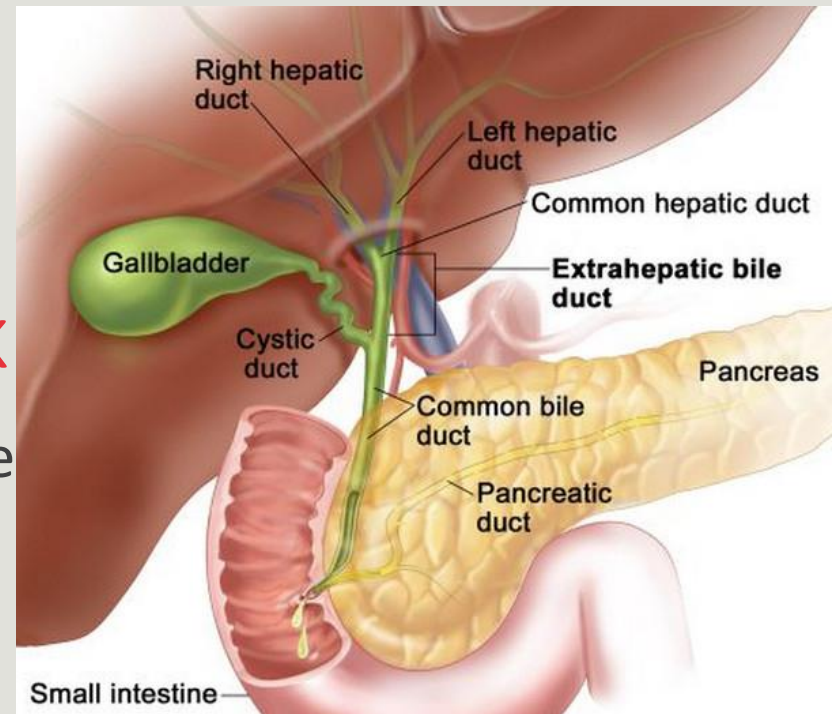
- Regulates metabolism

Gallbladder

Receives, stores, and concentrates bile from liver

When fats enter duodenum, duodenum releases hormone **CCK**

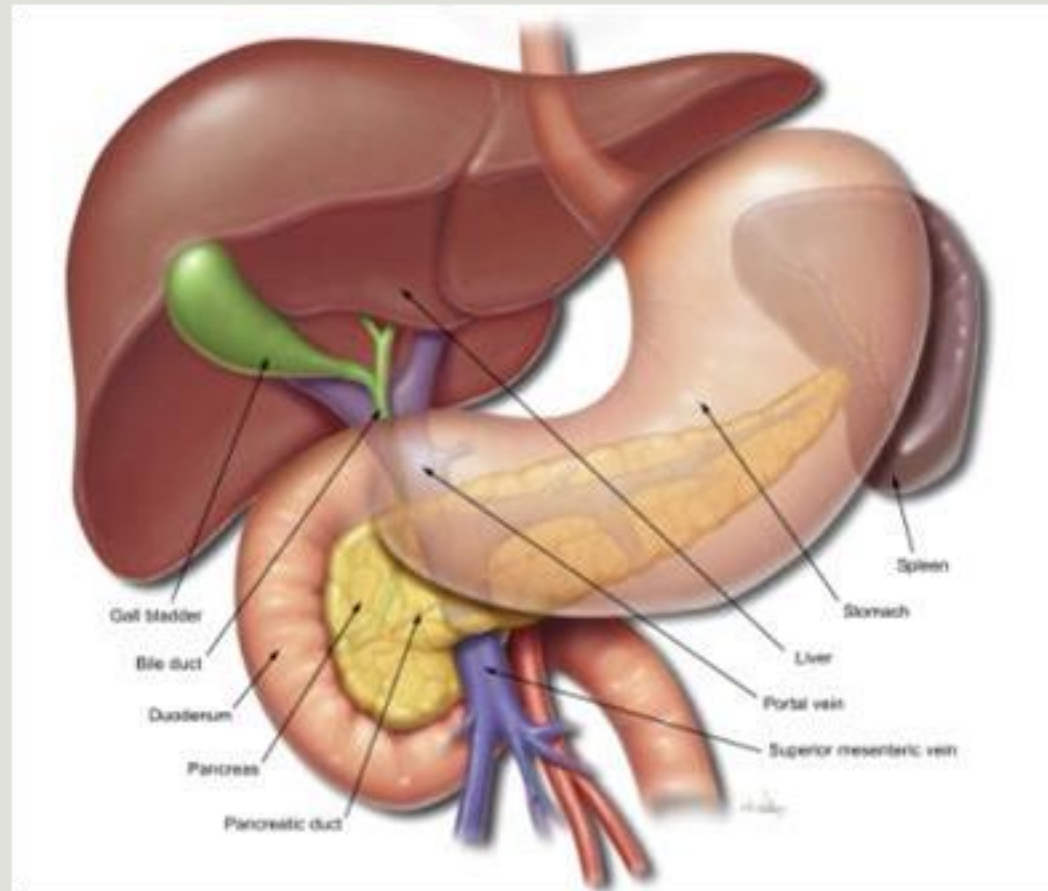
- CCK signals gallbladder to secrete bile to duodenum to digest fats



Pancreas

Finger / leaf shaped organ
that cradles under and
behind stomach

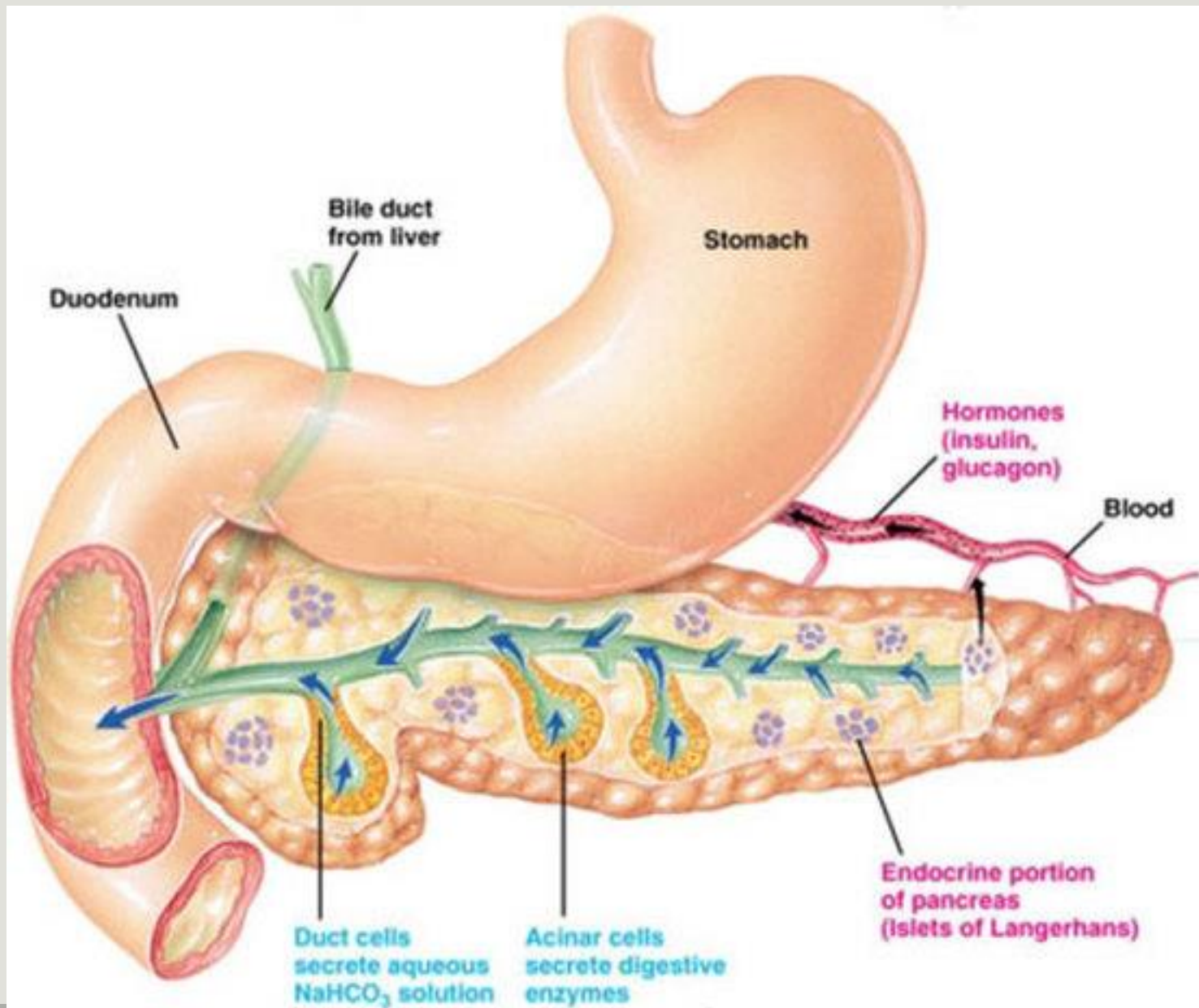
Secretes enzymes and
hormones



Pancreas

Acidity of chyme entering small intestine from stomach signals duodenum to secrete hormone **secretin**

- Secretin stimulates pancreas to release **sodium bicarbonate**
 - NaHCO_3 neutralizes chyme and makes small intestine basic
 - Pepsin becomes inactive so other chemical digestion can occur
 - Thus, the small intestine is protected from stomach acids by the release of secretin



Pancreas

Other pancreatic digestive enzymes:

- **Lipases** (breaks down fats)
- **Proteases** (breaks down proteins)
- **Carbohydases** (breaks down carbohydrates)

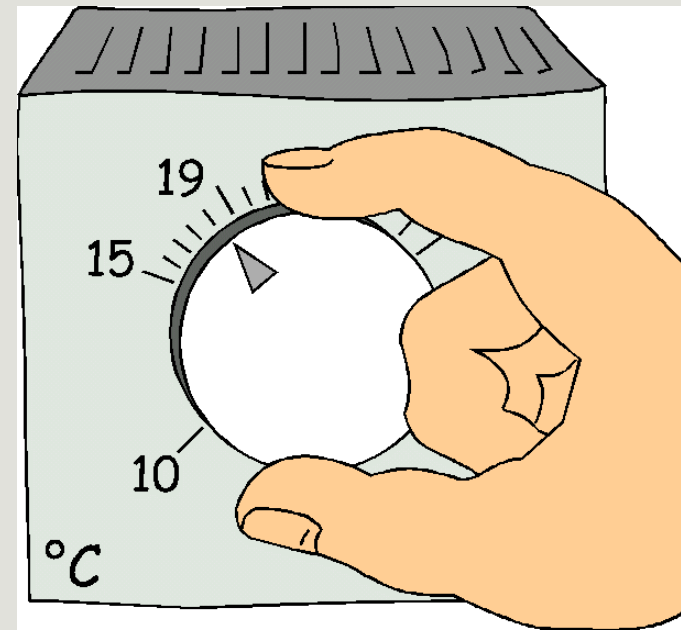
Secretes insulin and glucagon hormones to regulate blood sugar

Homeostasis

(maintenance of steady internal state)

Maintained through negative feedback loops

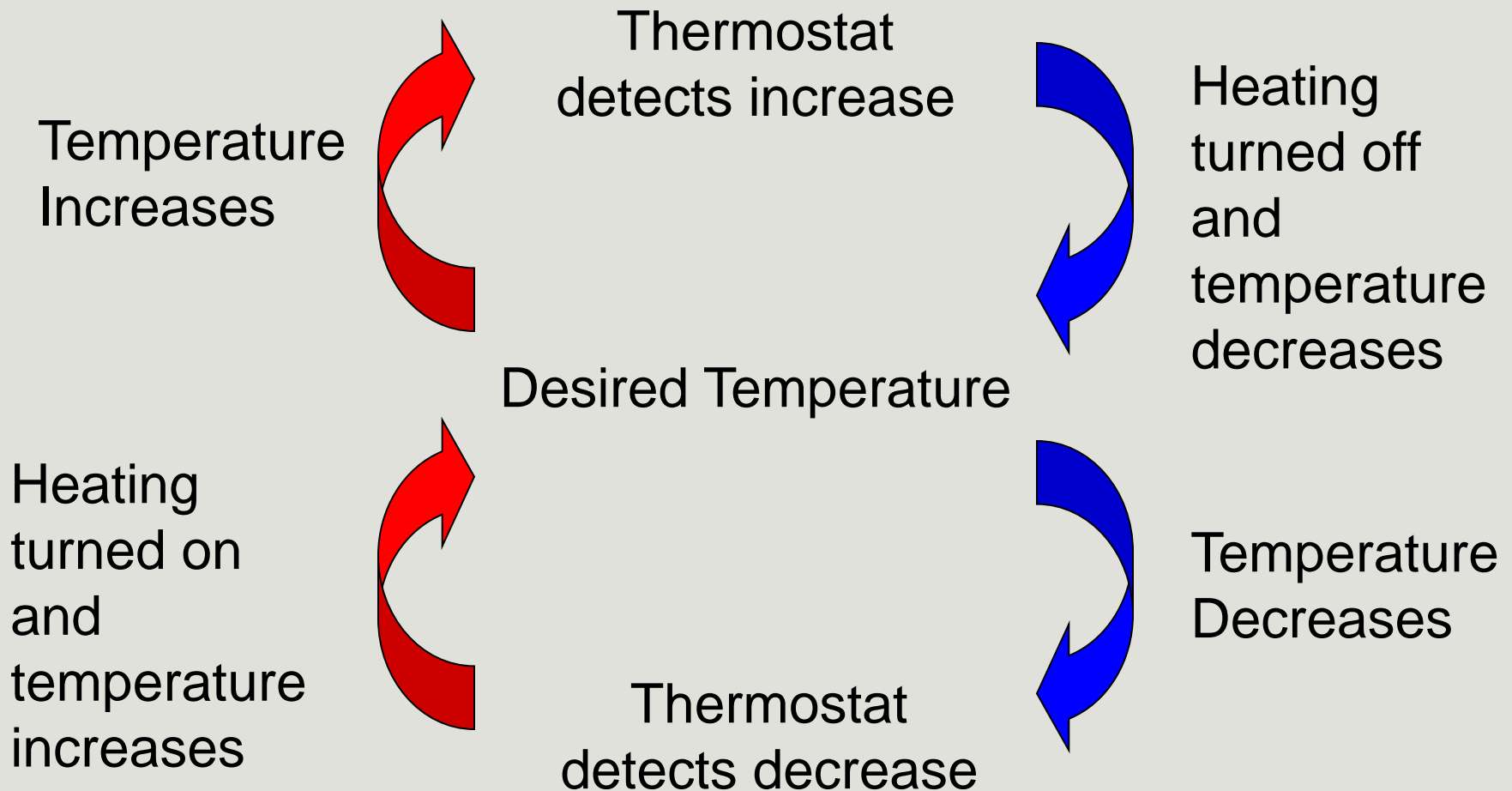
1. Variable rises above or falls below set point / norm
2. Receptors detect change and signal body to respond to restore norm
3. Organs receive signal and respond



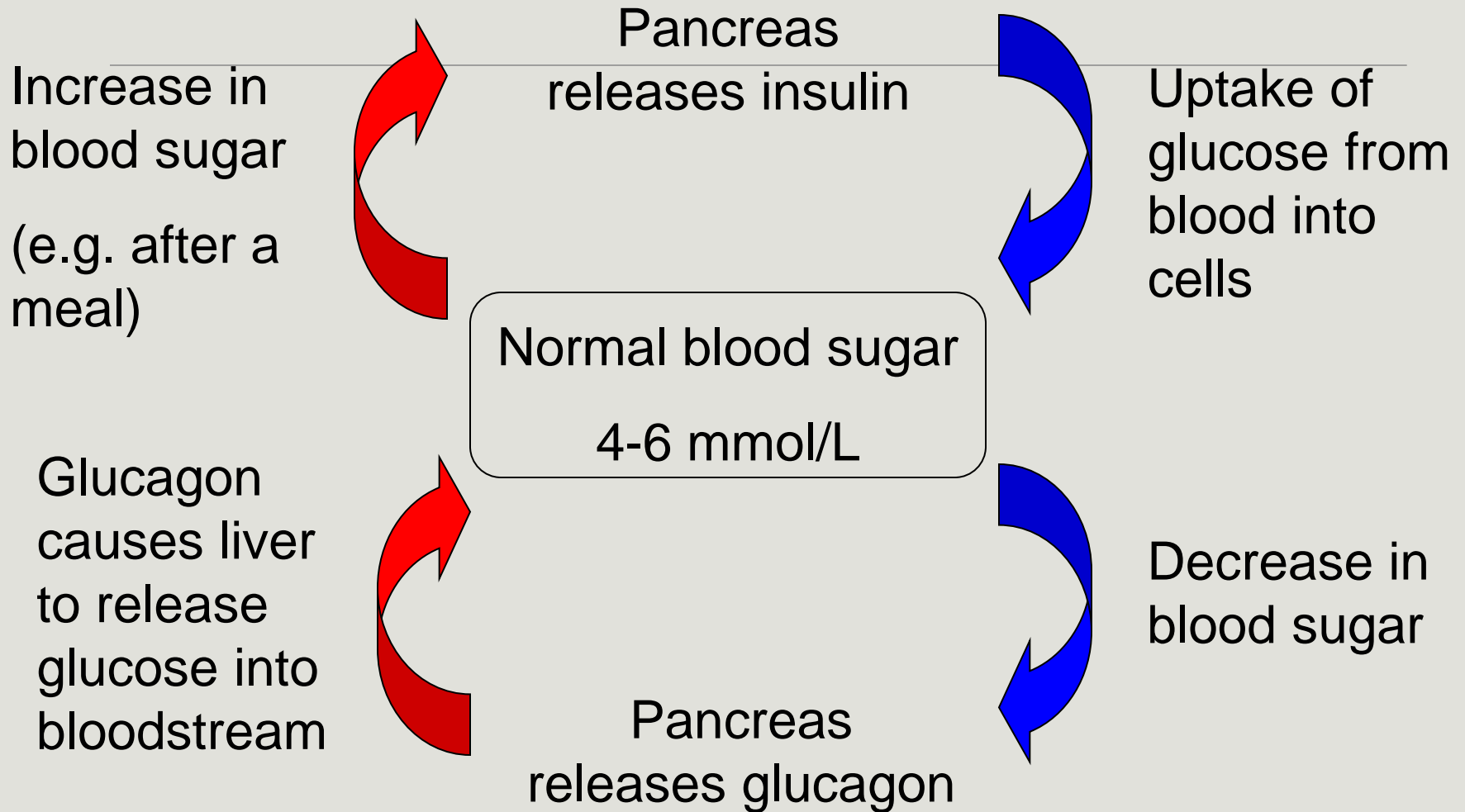
(like a thermostat)

Negative Feedback

(thermostat analogy)



Insulin Regulates Blood Sugar



hyperglycemic
> 120mg%

β

Beta cells of pancreas stimulated to release insulin into the blood

Insulin

Body cells take up more glucose

Liver takes up glucose and stores it as glycogen

Blood glucose level declines to a set point; stimulus for insulin release diminishes

STIMULUS:
Rising blood glucose level (e.g., after eating a carbohydrate-rich meal)

High

Homeostasis:
Blood glucose level

Low

STIMULUS:
• Removal of excess glucose from blood
• Low blood glucose level (e.g., after skipping a meal)

Blood glucose level rises to set point; stimulus for glucagon release diminishes

hypoglycemic
< 80mg%

α

Alpha cells of pancreas stimulated to release glucagon into the blood

Glucagon

Liver breaks down glycogen and releases glucose to the blood

| Enzyme or secretion | Secreted/ Produced By | Present and Active In | Nutrient acted upon (if applicable) |
|----------------------------|--------------------------------------|----------------------------------------------------|----------------------------------------------------|
| Pepsin | Stomach | Stomach Only active at low pH | Protein |
| Bile | Liver | Stored in gallbladder Active in small intestine | Fats |
| Amylase | Salivary Glands | Mouth/Saliva | Starch |
| HCl | Stomach | Stomach | provides the proper pH for pepsin |
| Carbohydrase | Pancreas | Small Intestine | Carbohydrates |
| Lipase | | | Fats |
| Protease | | | Proteins |

Digestive Disorders

Crohn's Disease

Chronic inflammatory bowel disease.

Most common in small/large intestine.

Causes:

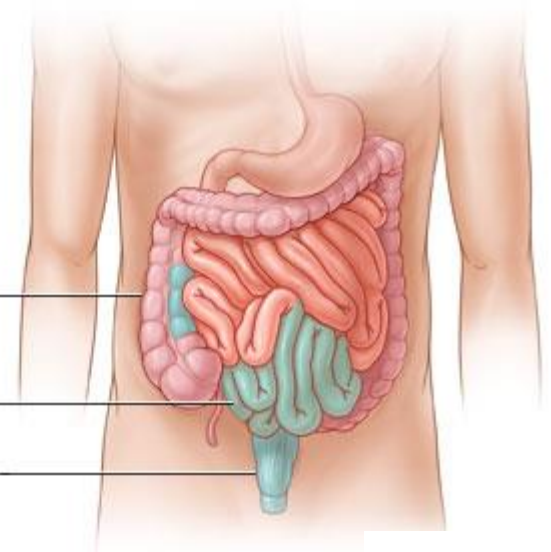
- Possible hereditary link to autoimmune disease (25%).
- Possible bacterial or viral infection.

Crohn's disease

Large
intestine
(colon)

Ileum

Rectum



Symptoms

Abdominal pain.

Intestinal bleeding.

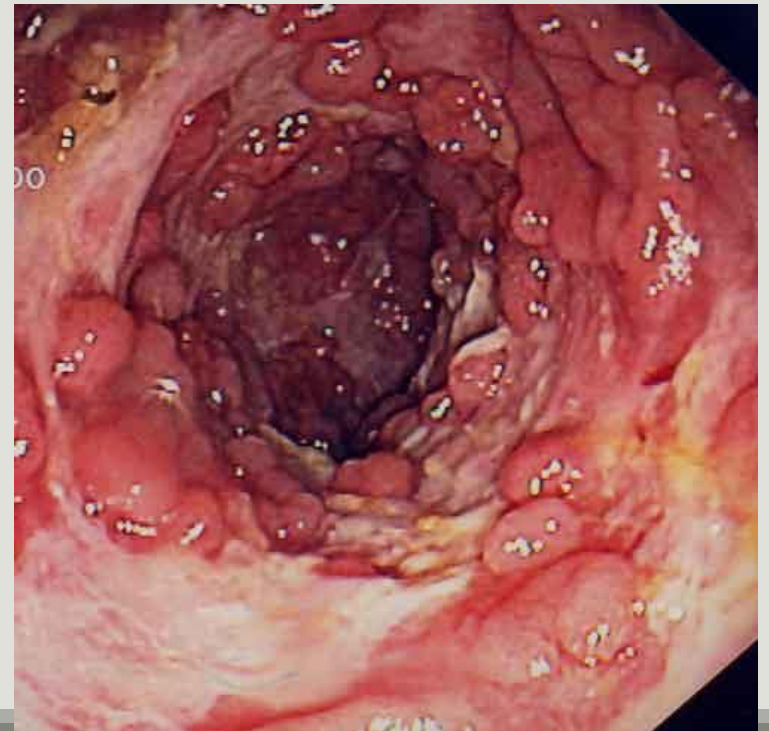
Diarrhea.

Nausea & vomiting.

Loss of appetite.

Weight loss.

Fever.



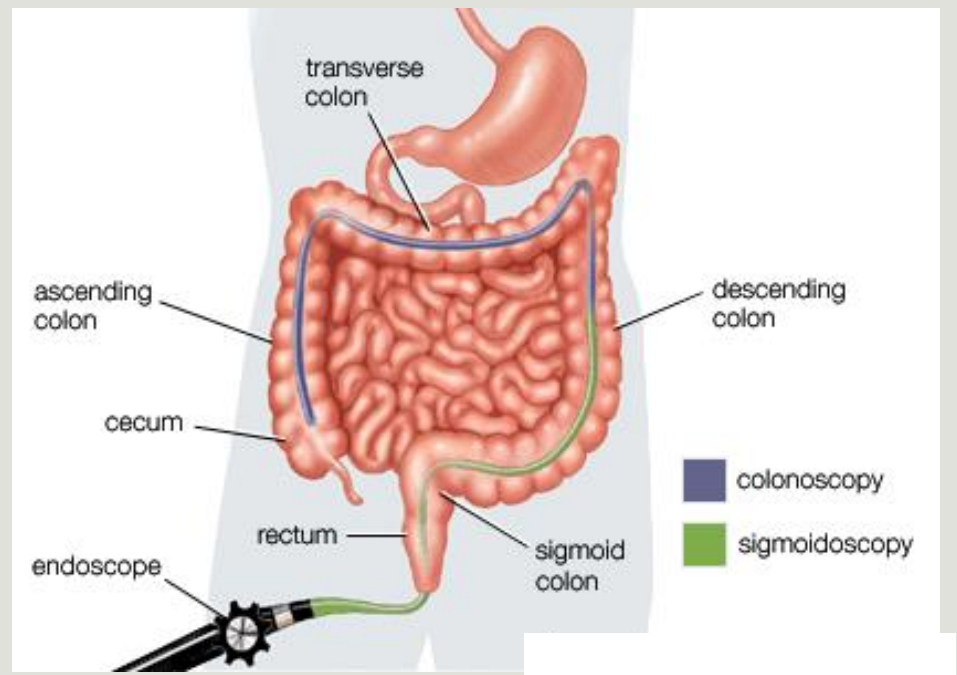
Diagnosis

Barium x-ray.

Colonoscopy.

[Homer gets a
colonoscopy](#)

[WATCH THIS!!!](#)



Treatment

No cure.

Medication to control inflammation or associated problems.

Avoidance of “trigger foods”.

Removal of blocked segments.

[WATCH THIS!!!](#)

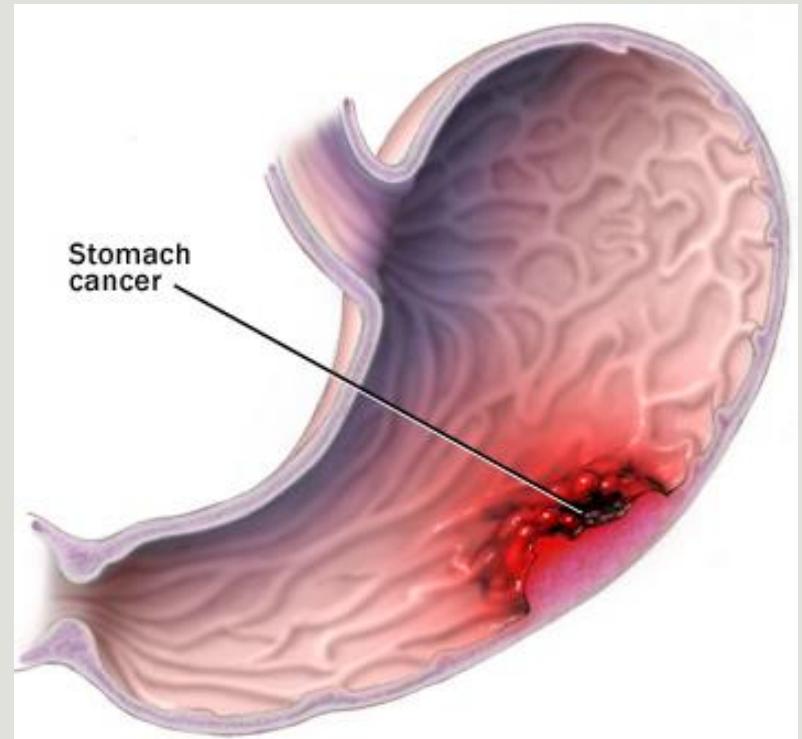
Stomach (Gastric) Cancer

Cancer of tissues lining stomach.

Exact cause unknown

Risk factors:

- *H. pylori* infection.
- Smoking.
- Poor diet.



Symptoms

Often non-specific

- Nausea and vomiting.
- Heartburn and indigestion.
- Fatigue.
- Stomach pain.
- Feeling full after eating little.

Diagnosis

Endoscopy & biopsy.

CT scans.

Barium Swallow X-ray.



Endoscope
inserted
into mouth

Treatment

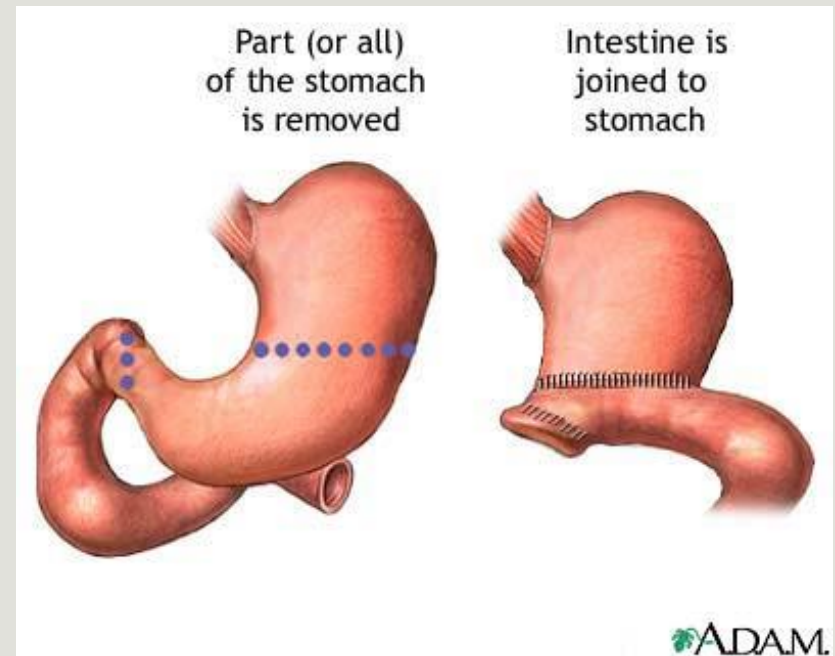
Radiation therapy & chemotherapy

- To shrink tumor.

Gastrectomy

- Partial or total removal.

[WATCH THIS!!!](#)

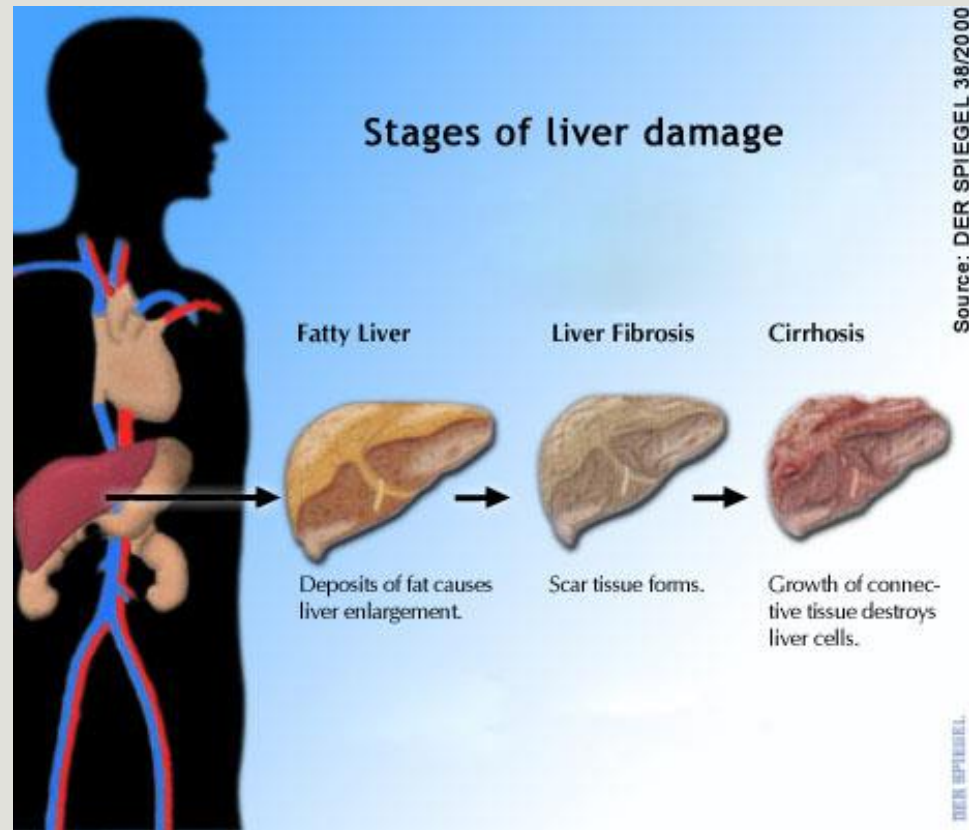


Cirrhosis

Scarring of the liver.

Leads to loss of liver function.

Caused by chronic damage to liver (e.g., hepatitis & alcoholism).



Symptoms

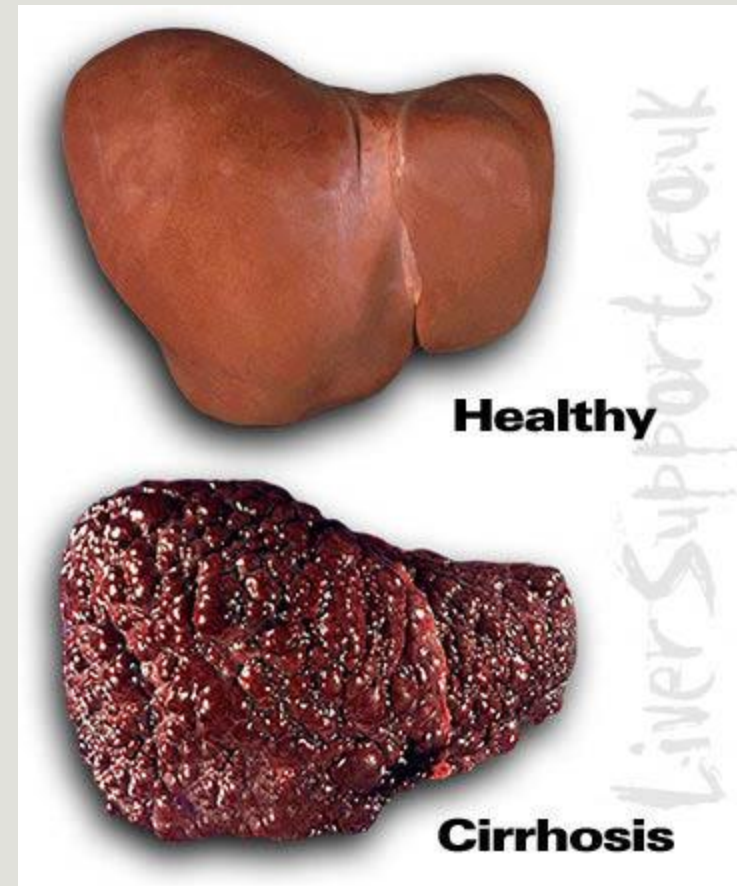
Fatigue

Loss of appetite.

Easy bruising & bleeding.

Nausea & vomiting.

Fluid retention in abdominal region.



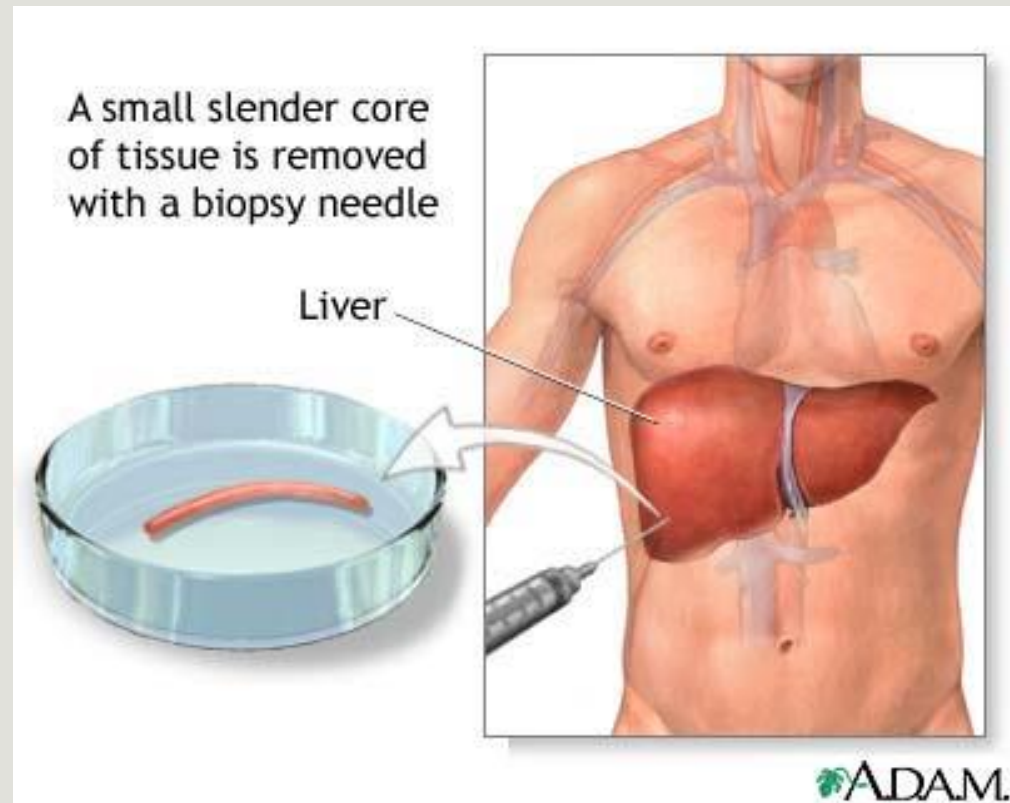
Diagnosis

Blood tests.

Liver Biopsy.

CT or MRI scan.

Ultrasound.



Treatment

Damage cannot be reversed.

Avoidance of alcohol.

Liver transplant.

[WATCH THIS!!!](#)

